Reducing the Carbon Footprint Through Land Use and Transportation

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Managed Lanes:
Potential Reductions to Atlanta's Carbon Footprint

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Overview

- Carbon Footprint Definition
- EPA’s Role
- Managed Lanes Policy Options and Analysis
- Describe Assumptions
- Show Results

What is a Carbon Footprint?

- Carbon Footprint
  - The total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons or kilogram (kg) of carbon dioxide (CO2).
  - For each gallon of gasoline fuel consumed, 8.7 kg carbon dioxide (CO2) is emitted
  - Average American has a carbon footprint of 20 tons of CO2 per year.

EPA Air Quality – Key Vehicular Emissions

- Several automobile relevant atmospheric species are regulated by the National Ambient Air Quality Standards of the Clean Air Act
  - Carbon Monoxide (CO)
  - Nitrogen Dioxides (NO_x)
  - Particulate Matter smaller than or equal to 10 μm in diameter (PM_{10})
  - Particulate Matter smaller than or equal to 2.5 μm in diameter ($PM_{2.5}$)
  - Ozone (not a direct emission but produced photochemically in the presence of volatile organic compounds (VOC) and NO_x)

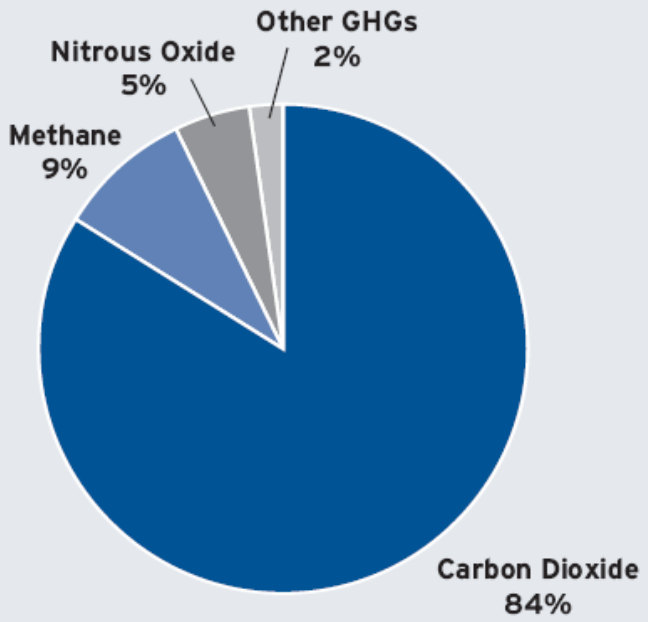
CO_2 Regulations

- Federal CO_2 Regulations Forthcoming?
  - 17 states have adopted emissions reductions targets
    - Vary by effective date, stringency, mandatory, voluntary
  - Massachusetts v. EPA (decided April 2, 2007)
    - EPA has responsibility to regulate GHG for public health and welfare
  - Other Countries agreeing to Kyoto Protocol
    - Australia, Canada, EU, Japan, New Zealand

Background

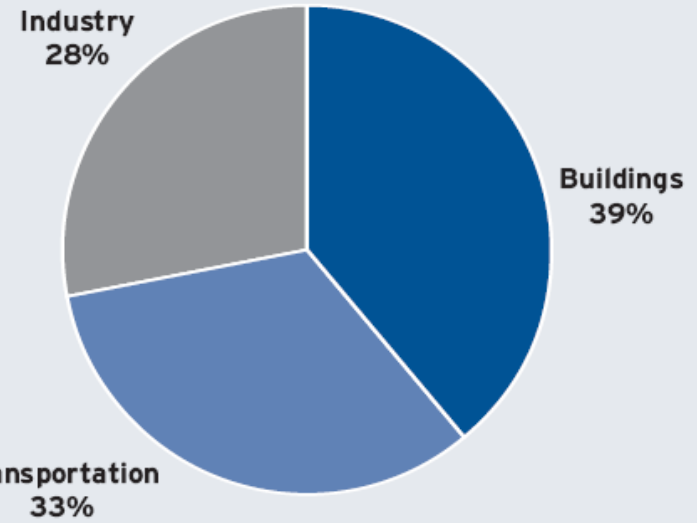
Carbon dioxide is the most prevalent greenhouse gas (GHG) emitted in the United States and it primarily comes from the energy used in buildings and transportation

U.S. GHG Emissions (2005)



Source: Environmental Protection Agency

U.S. CO_2 Emissions by Sector (2005)



Source: Energy Information Administration

Source: Brookings Institute May 2008

Recent Federal Acts

- Energy Independence and Security Act of 2007
  - Corporate Average Fuel Economy (CAFE) for new passenger vehicles to rise to 35 MPG by 2020, a 40% average increase over 2007 standards of 27.5 mpg for cars and 22.5 mpg for light trucks and SUVs.
  - Renewable fuel requirements would reduce life cycle GHG by 10% by 2025.
  - Absent growth in driving, these measures would reduce CO2 emissions by 23% below 2005 levels.

Source: Growing Cooler, R. Ewing et al. 2008

Vehicle Miles Traveled

- VMT forecasted to increase 48% between 2005 and 2030

- VMT increase negates any air pollutant reduction gained from CAFE standard increase and renewable fuel requirements.

Source: Department of Energy Information Administration

Growing Cooler, R. Ewing et al. 2008

Multiple Approaches

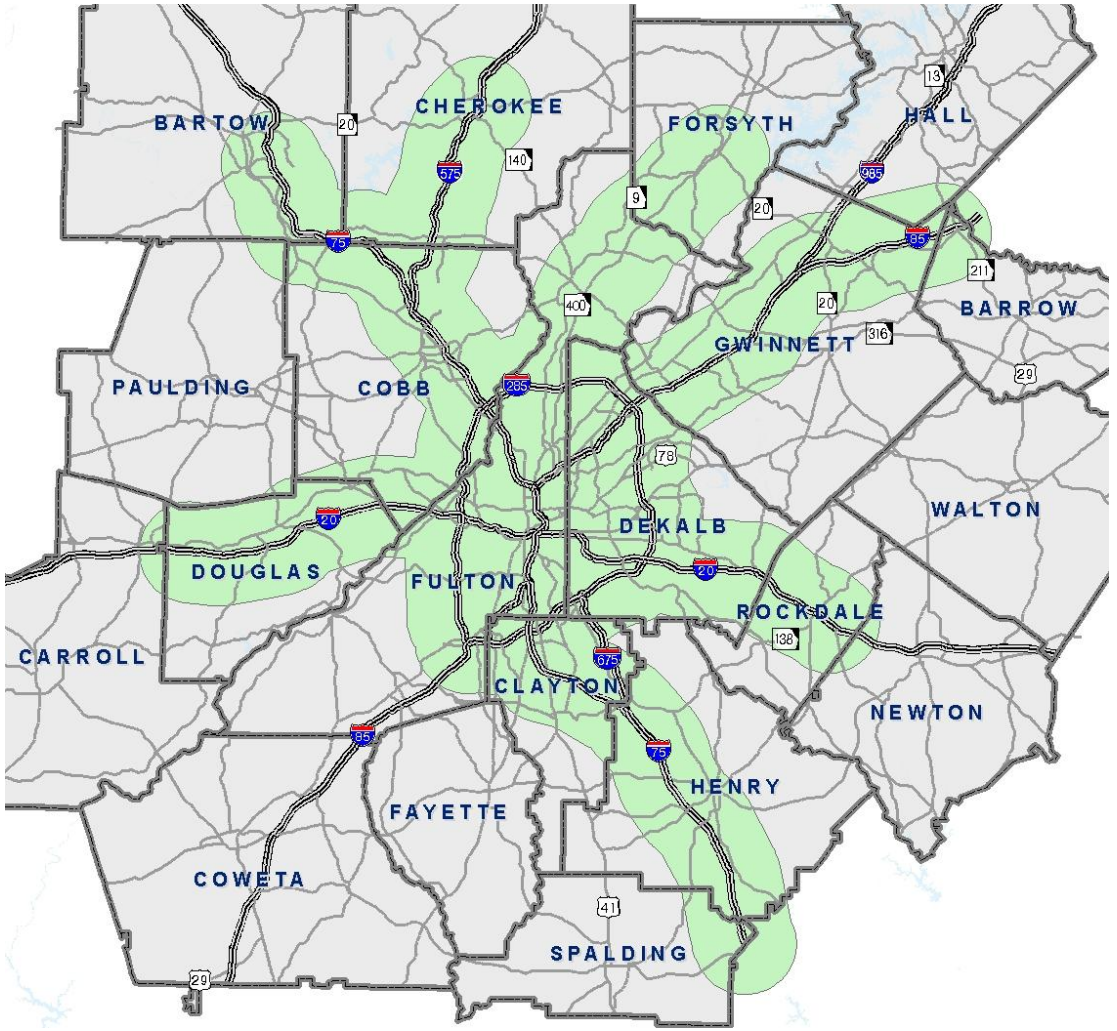
- In order to have carbon dioxide reductions, multiple approaches must be employed:
  - Land use
  - Alternatives to reduce VMT
  - Policy Incentives to reduce CO2 emissions

Managed Lanes
Policy Options and Analysis

Managed Lanes Potential

- How would Managed Lanes help reduce CO2 emissions in the Atlanta Region?
  - Reduced congestion on the highways
  - Guaranteed transit travel times increase competitiveness with Single-Occupant Vehicles

MLSP Study Area



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Managed Lanes Policies

- Eligibility Policies
  - *Cars Only (Transit)*
    - High Occupancy Tolls (HOT)
      - HOT2 – with 2 passengers no tolls charged
      - HOT3
      - HOT4
    - ETL – Electronic Toll Lanes – all vehicles pay toll
  - *Truck Only*
    - Truck Only Tolls (TOT)
  - *Cars & Trucks (Transit)*
    - Mixed ETL
    - ETL/TOT

- Pricing Policy
  - *Maximize Throughput* - price the lanes to maximize the number of users while maintaining a threshold speed of 45 mph.

MANAGED LANES SYSTEM PLAN

- Congestion Reductions
  - –Decreased vehicle hours traveled, which reduces emissions for wasted, burned fuel from idling in traffic
- Less fuel burned means less emissions
  - –Quantity of gasoline conserved directly relates to reduced vehicle emissions
- Guaranteed 45 mph travel speeds
  - –Managed lane travel keeps vehicles at the most efficient travel speed

MANAGED LANES SYSTEM PLAN

- Time Saved in Delay Compared to No Project Undertaken
  - –Establishes benchmark for gasoline conserved
- Texas Transportation Institute
  - –0.68 gallons of fuel per hour
  - –300 driving days per year
- Guaranteed 45 mph travel speeds
  - –Managed lane travel keeps vehicles at the most efficient travel speed

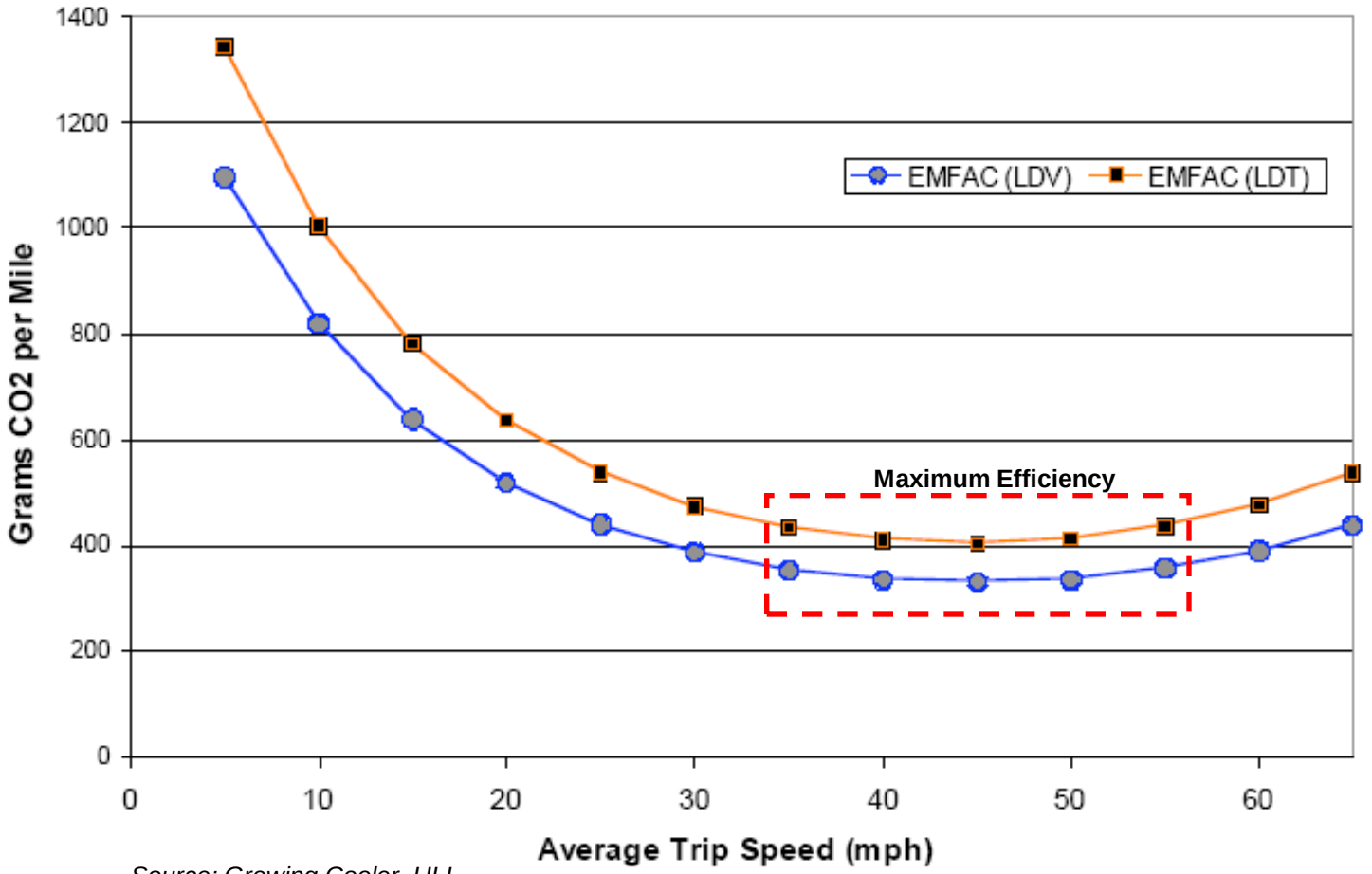
MANAGED LANES SYSTEM PLAN

- Data Assumptions
  - 80% Car/Light Truck 20% Diesel Truck
  - 4 miles buffer of the MLSP corridor
  - Gasoline savings assumptions (0.68 gallons per hour and 300 driving days per year)

MANAGED LANES SYSTEM PLAN

- Methodology
  - Established emission rates in g/gal of gasoline consumed from literature reviews
  - Used delay induced gasoline wasted to established a benchmark for ‘excess emissions’ – emissions that otherwise wouldn’t be apart of the system if it weren’t for congestion
  - Emission reductions a function of delay reduction directly on the corridor

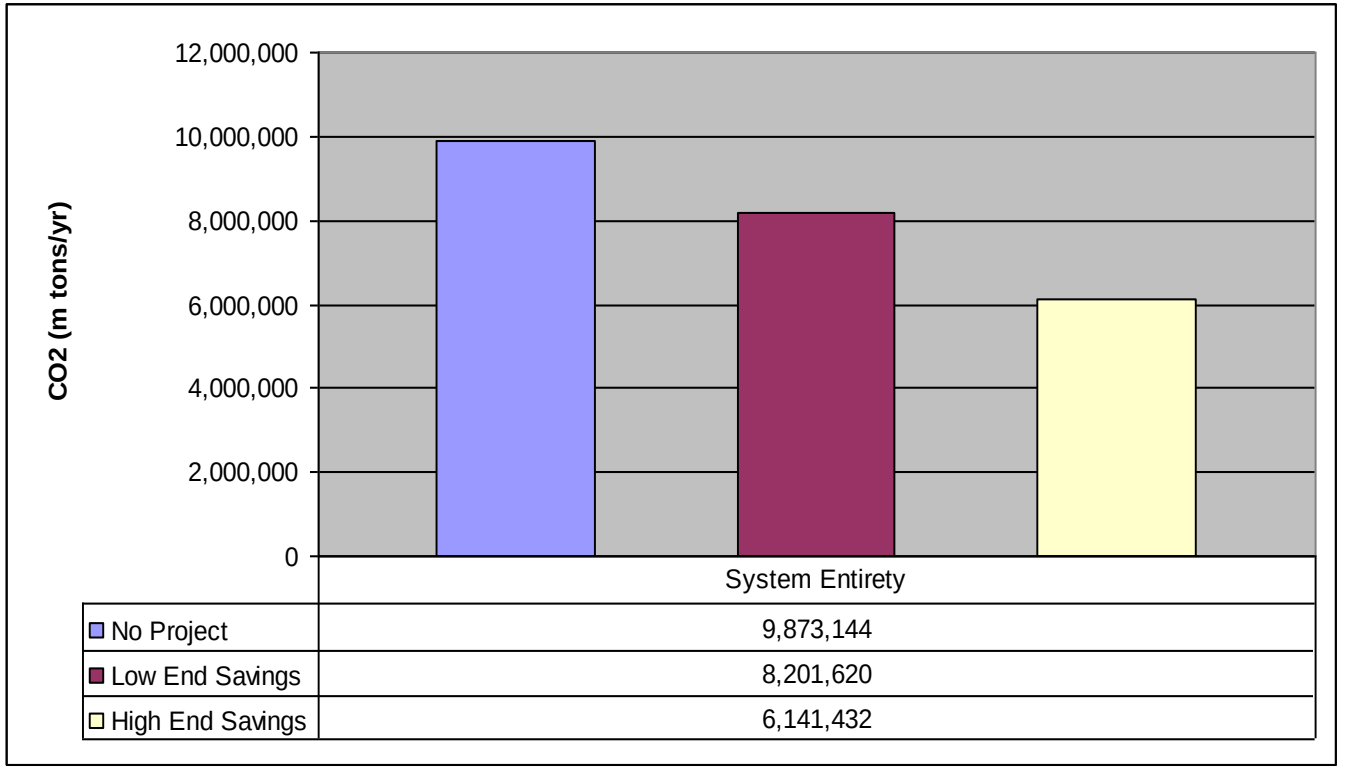
Climate Change – Trip Speed/Emission Relationship



Source: Growing Cooler, ULI

- Managed flow provides more reliable travel speeds
- Reduced congestion reduces emission rate/mile
- Applies to other vehicular emissions as well (NO_x, VOC, PM, etc)

Climate Change – Results



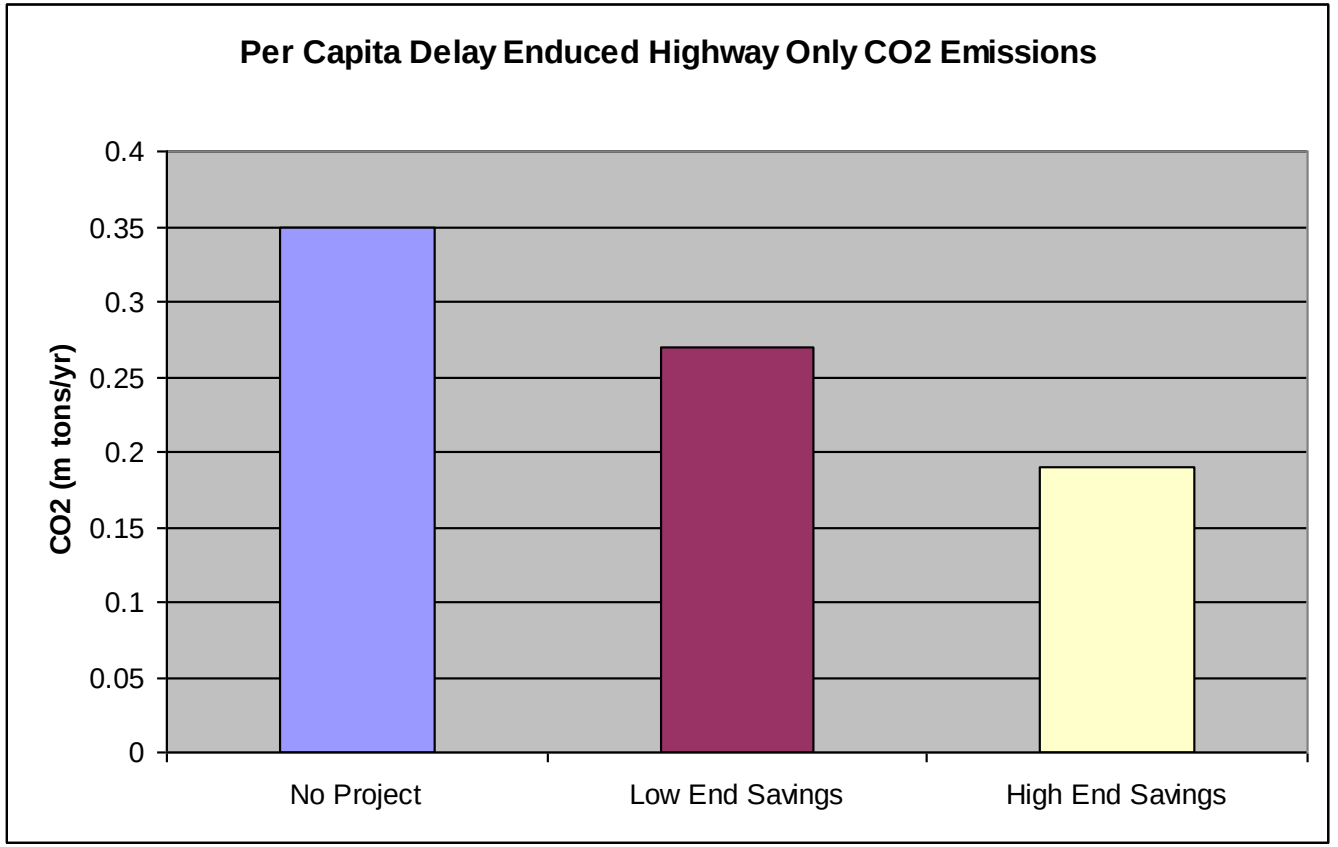
- 17 – 38 % drop in wasted CO_2 emissions over no build conditions
- Roads within a 4-mile buffer of the interstate system in Atlanta region

Putting the CO2 Reductions in Perspective

- 2.4 million tons CO2 per year savings is equivalent to the carbon reductions produced by 14 80MW solar farms (640 acres each)

Source: Climate Change in the Atlanta Metropolitan Region

Carbon Footprint Reduction - Results



- Assumes 2030 population of 6.97 million
- With managed lanes, this could be 0.19 – 0.27 m tons per capita, a 23 – 46 % reduction compared to the no project scenario
- Reducing delay can substantially contribute to carbon footprint reductions in metropolitan Atlanta

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Managed Lanes

- Managed Lanes offer:
  - Traffic congestion reduction
  - Transit and carpool travel time benefits
  - Multiple options for transportation
  - Air quality benefits, reduced associated health risks

Questions

- Determine Your Carbon Footprint
  - Take steps to reduce it

Thanks!

Questions?